

Haven (S.F.)

CYSTICERCI WITHIN THE EYE,
WITH REMARKS.

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BY S. F. HAVEN, JR., M.D.

CASES OF CYSTICERCI

IN THE

POSTERIOR CHAMBER OF THE HUMAN EYE,

WITH REMARKS.

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SINCE the discovery of entozoa upon the human conjunctiva, and especially since the one seen in the anterior chamber by Dr. Schott (and described by Dr. Soemmerring*), it has naturally been conjectured that they probably also exist in the posterior chamber; and it only remained for the ophthalmoscope to substantiate this belief. I have drawn up the following paper, partly from the published cases of Dr. Graefe, and partly from notes taken while abroad. The nine cases given are all those of cysticerci in the posterior part of the eye.

I. *Cysticercus* on or in the *Retina*.—A married woman, 28 years of age, free from superficial cysticerci, and from symptoms of a tape worm, presented herself at Dr. Graefe's clinique. Three weeks previous, she had begun to perceive before the left eye a cloud, which appeared first in the centre of vision, and then spread gradually toward the sides. At the time of examination only the glimmering of large and strongly-lighted objects in the direct axis of vision could be seen, which seemed as though viewed through a thick mist. Above and below, however, and on both sides, fingers could be counted at the distance of some feet. The ophthalmoscope showed the lens and vitreous humor to be clear; but, covering the central part of the retina, there appeared a shining greenish body, the convex circular sides of which were sharply defined upon the retina. It was so large that, with the pupil dilated, and with the instrument in close proximity, the whole extent could hardly be seen at once. As it lay somewhat outward, the distance of its inner border from the entrance of the optic nerve was about equal to the diameter of the latter. That the anterior surface of

* Mackenzie in his last edition mentions four other cases of cysticerci in the anterior chamber.

the body stood at some distance from the retina, was proved from the fact that it could be distinctly seen without a concave glass at a greater distance than it was possible to see the retina. In order to obtain a general view of this body, its inverted image was examined.* It now appeared as a perfectly round greenish bladder, of a diameter nearly four times that of the entrance to the optic nerve, and was firmly seated on the retina. The neighboring parts of the retina seemed normal. From them some fine-pointed vessels elevated themselves upon the sides of the body, though whether they ran into the walls themselves, or into a transparent membrane covering the bladder, was then uncertain. In the middle of the anterior wall a white knob-like appendix could be seen, which manifested itself both by its greater opacity and by its color. This was not stationary, but changed its position frequently, and at the same time, with the eye in a perfect state of rest, cup-like depressions in the walls of the bladder could be seen to form and disappear. Dr. Graefe tried in vain to make out different parts of the head, and to discover a neck-piece. The thing seemed, as it were, veiled, which strengthened him in the belief of an enveloping membrane.

Three weeks later, the bladder had increased about one third in diameter. The inner border had now reached the outer edge of the optic nerve, on which latter the normal distribution of vessels could be seen. The knob-like appendix or head was no longer in the centre, but close under the upper edge of the bladder, and, as it were, in the middle of a second small bladder which had grown out from the larger one. The fact that at this point the ophthalmoscopic view was much clearer, and that there was a cessation of vessels, convinced Dr. Graefe that there was an enveloping membrane which was here broken through by the further growth of the bladder-like projection. By this time not only were bunches (sucking-cups) on the side of the head to be seen, but also the previously concealed neck-piece, which was now extended and now drawn in, thus allowing the head, by a series of trunk-like motions, a great variety of positions. The patient's sight was much diminished, only a faint perception of light downward and outward remaining.

Ten weeks after the first observation, the original bladder had not greatly increased, but had lost its greenish appearance, and was more transparent. The vessels on it had mostly either entirely disappeared, or were remaining merely as faint lines. On the other hand, the second bladder had so enlarged as nearly to

* As the terms "inverted" and "uninverted images" may not be familiar to all, I would say that a simple mirror, with or without a concave lens, gives an uninverted image. With this, however, only a portion of the bottom of the eye can be seen at once. A convex lens held before the mirror gives an inverted image, which is much smaller than the other, and which allows a proportionately greater extent of surface to be seen. The inverted image is better for obtaining a general view of the bottom of the eye, and the uninverted is more convenient for examining in detail.

equal the original one, exhibited, as that one did before, a shining greenish color, was separated from it by a constriction, and covered the optic nerve entirely. The visible portion of the retina was no longer normal, but was sprinkled with irregular bluish-white spots. Vision was almost null.

Five months after the first observation, the original bladder had fallen to pieces, and only a membrane floating in folds and without form was to be seen. The contour of the second bladder was with difficulty made out, because it was covered with a similar membrane. For some time Dr. Graefe thought the worm dead, but was mistaken. The head and neck lay so far inward toward the nose, that, in order to see them, it was necessary to make the patient look strongly to the right. The bladder, between the membrane and retina, seemed to be movable. Vision was null.

At one time Dr. Graefe proposed the attempted destruction of the worm by means of a cataract needle through the sclerotica, guided by the ophthalmoscope. The appearance of degeneration in the bottom of the eye, however, prevented it. Instead of this, he tried dropping anthelmintic substances into the eye, viz., a solution of acetate of potash, and a santonin preparation. These were, however, unsuccessful, inasmuch as, eight months after the first observation, the worm was still living.

II. *Cysticercus on the Retina*.—An instructress, of pale appearance, and with a constitution not very strong, who had in childhood suffered much from ascarides, came to Dr. Graefe on account of her sight. Some months before, she first discovered some pieces of a tape worm, but no cysticerci were to be found on the surface of the body. A year previous to this, she had experienced pains in the limbs, and transient feebleness in one arm. After this, she had a weakness in both eyes (but without limitation of vision), which soon disappeared from the left one, whilst in the right a slight inflammation set in. At the same time a glimmering and mistiness came before this eye, accompanied by severe headache on the right side. Two months ago, she could not read with the right eye, and soon after ceased to recognize any one with it.

At the time of her appearance at Dr. Graefe's, only a faint perception of light was left. Externally, the eye seemed normal. The ophthalmoscope showed upon the retina a round, greenish, bladder-like body—though upward and inward it was drawn out into a cylindrical continuation—which, by the characteristic motions described in the preceding case, rendered the diagnosis of cysticercus easy. A light membranous veil seemed to soften the handsome bluish-green color. Where the cylinder joined the bladder, there was a whitish head, which appeared to be alternately stretched out from and drawn into the bladder by means of a neck-piece of variable length. How the union of the cylinder with the retina was made, could not be seen. Prolongations of vessels could neither

be seen upon the bladder nor upon the neck-portion. Spots similar to those described in the first case were found upon the bottom of the eye. Fig. 1 represents the bladder with the head drawn in, and Fig. 2 with it stretched out. The spots are given in both.

Fig 1.

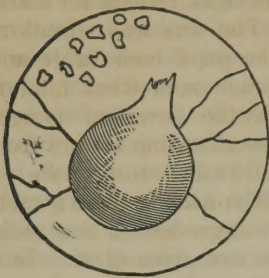
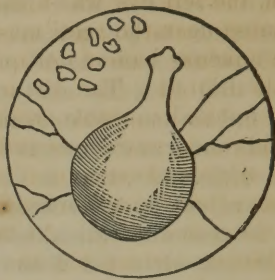


Fig. 2.



A series of observations for several months showed no material changes in the size or form of the entozoon, only the color became gradually paler. On examining the eye, nine months after the first observation, Dr. Graefe found, instead of the bladder, only a colorless membrane, or rather a system of membranes, floating in the vitreous humor, and covering most of the retina. All perception of light had disappeared since the first few months. A still later examination showed that phthisis bulbi had set in. The former weakness of one arm, the severe headache, and the glimmerings and flashings of light which troubled the other eye—though nothing could be seen within it—caused Dr. Graefe to suspect the existence of entozoa within the brain; and the presence of intestinal worms also served to increase this suspicion.

III. *Cysticercus on the Retina*.—The third case of retinal cysticercus seen by Dr. Graefe was in the right eye of a strong, hearty peasant, who exhibited neither superficial cysticerci nor any symptoms of tape-worms. The bladder was adherent to the outer part of the bottom of the eye, and glimmered through a system of transparent membranes. The motions of the bladder and neck-piece were evident, but the sucking-cups were only imperfectly made out. This eye was entirely blind, while the other one remained sound. The patient was seen but once.

IV. *Cysticercus on the Retina*.—A lady, 20 years old, of a rather delicate constitution, had been as a child much troubled with epistaxis and oppressive headaches. The latter had continued up to the time of her appearance at Dr. Graefe's, with only short intermissions weekly. She had been married two and a half years, was for the first time confined fifteen months before, and at the time of her appearance, January 1st, 1855, was again five months pregnant. In August, 1854, according to the patient's account, some days after conception, she observed before the left eye a slight

veil, which covered the whole field of vision, so that she could scarcely make out medium-sized print. At the same time there set in periodical flashes of light, in the form of small circular appearances. The veil grew gradually darker, so that now little else than quantitative perception of light* remained. On examination, the left eye was found softer than the right, though no marked flatness near the recti muscles existed. The iris was discolored, the aqueous humor not quite clear, and the pupil immovable and a little dilated. The disturbed aqueous humor somewhat hindered the ophthalmoscopic examination. With the inverted image a membrane, continuous and in folds, was seen floating to and fro in the vitreous humor, not far, as it seemed, before the retina. In some places, viz., inward and downward, it appeared to be attached to the retina itself. At these points several greenish and strongly-reflecting stripes hid the bottom of the eye from view. In the upper and outer part there glimmered through the membrane a round greenish bladder, which terminated downward in a neck and head-piece. Continued observations showed undulating motions in the surface of the bladder, and contractions and extensions in the neck portion similar to those mentioned in the previous cases. With regard to the existence of *tæniæ*, no decided information was given by the patient. No superficial entozoa were found. This case distinguishes itself from the previous ones by the marked affection of the vitreous humor, and probably also of the inner membranes, as the iritis betokened.

V. *Cysticercus in or behind the Retina*.—Dorothea M., aged 58. Has been perfectly healthy, and has never suffered from tape worms. Says that the sight of both eyes has always been equal, though this is not to be depended upon, as she never compared them together. Eight weeks ago, after having suffered some time from rheumatic headache, she began to feel an internal pressure in the right eye. This was continued, without paroxysms, maintained its position, and was not heavy enough to prevent sleep. At the same time the patient noticed a redness in the corner of the eye. Made attentive by this, she closed the left eye, and now perceived in the middle of the right one a black spot, together with marked weakness of vision. At that time she was also troubled with *muscæ volitantes*, which afterward disappeared.

Externally, no disease is to be seen. The ophthalmoscope exhibits, through normal refracting media, a cysticercus bladder placed on the bottom of the eye and projecting forward, and nearly four times as large in diameter as the entrance of the optic nerve. The general appearances and movements are similar to those described in the other cases. The bladder is evidently en-

* Dr. Graefe uses the expression *quantitive* perception, in contradistinction to *qualitive*; the latter referring to the power of recognizing objects, and the former merely to the impression of light. The terms prove very convenient.

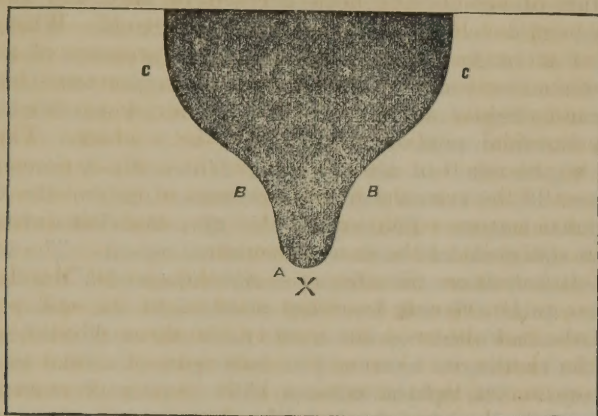
veloped in a second membrane, as is shown by the distension of the latter during the movements of the cysticercus. From all sides the retinal vessels run up on to this membrane, and especially from the inner side (where the principal vessels usually lie). The ramifications on the membrane are similar to those on the retina. It is very probable that the retina itself covers the cysticercus sac, and that the latter lies between the choroid and the retina; though, possibly, only the inner layer of the retina, with the stratum of vessels, has been pressed forward, and the entozoon has been developed in the retinal tissue itself. What speaks in favor of an origin from the choroid, is the presence of a yellow spotted, circumscribed choroidal portion, lying outward from the bladder, and slightly spread over its contour, which is connected with the choroidal portion lying under the bladder. This may, perhaps, be the result of a limited choroiditis which accompanied, as is generally the rule, the first appearance of the entozoon. The former inflammatory condition of the eye, and the intra-ocular pain, may also point in the same direction.

VI. *Cysticercus on the Retina*.—At the end of March, 1856, there came to Dr. Graefe a servant maid, aged 25, and perfectly healthy, who had observed, for from two to three months, a weakness of the right eye. Vision was now reduced almost to quantitative perception of light, it being a little clearer downward than elsewhere. She had never experienced pain or flashes of light. The left eye was quite sound. The ophthalmoscope showed an extensive granular degeneration in the central field of vision, as to the nature of which Dr. Graefe was in considerable doubt, though in some portions it bore a resemblance to that described in Case II. (see figs. 1 and 2). On the lower part of the retina, and separated from this degeneration by a healthy portion, lay a cysticercus of a diameter nearly four times that of the optic papilla. It exhibited the usual characteristics, and was firmly attached to the retina. No vessels ran over the bladder; on the other hand, one retinal vessel was plainly to be seen disappearing under the body, so that the latter could not be underneath the retina. The association of the above-mentioned degeneration with the cysticercus was highly interesting. Dr. Graefe hoped to make some further observations, but in the course of a few weeks a series of fine membranes were developed in the vitreous humor, which prevented the examinations. The patient exhibited no superficial cysticerci, had neither suffered from tæniæ nor headache, and was not pregnant.

VII. *Cysticercus behind the Retina*.—An engraver, aged 46, of pale color, but otherwise healthy, while using a lens some months before coming to Dr. Graefe, observed a circular defect in the upper and outer part of the field of vision of the right eye. This round "black" spot gradually increased, but changed its position

in such a way that, when the patient was seen, it lay directly upward, while the lower border nearly reached the centre of vision. The sharpness of sight had been gradually lost in the whole field of vision, so that the patient saw as through a veil. On testing the field of vision with a black-board,* it was found free on both sides and below, but above showed a defect which began a short distance from the centre (X Fig. 3), with a rounded end (A), con-

Fig. 3.



tinued for a short distance slightly increasing (B—B), and then rapidly bulged out at the sides (C—C), to a considerable size. The ophthalmoscope showed a quantity of fine membranes floating in the vitreous humor, which were sufficiently developed to account for the weakness of sight, but not for the defect above described. They also interfered somewhat with the ophthalmoscopic view, but, under favorable positions, and with a dilated pupil, an unmistakable cysticercus could be made out, the white head-portion of which lay outward from the centre. The condition of the retina was especially interesting. It was raised near the centre in a fold (partial separation), which bulged out and so covered the cysticercus that tolerably large vessels could be seen running over the bladder. The form of this retinal separation explained the defect of vision, since the cysticercus (lying partially eccentric) was not sufficient to do so. The condition of the choroid was also interesting. Almost the whole periphery of the cysticercus

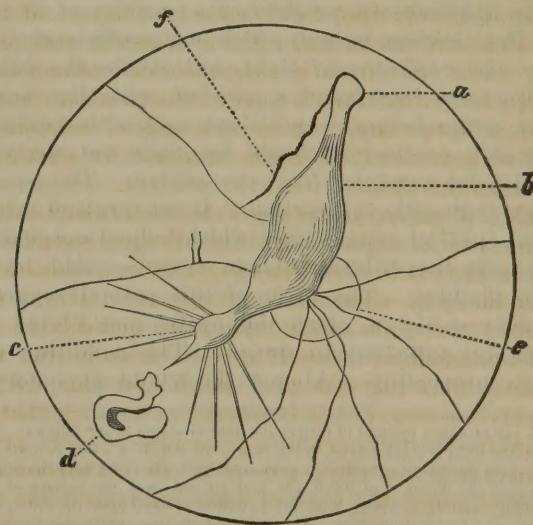
* Dr. Graefe's method of testing the field of vision is as follows: The patient is placed one or two feet from a black-board, in the centre of which a cross is marked with chalk. He is told to cover up the sound eye, and to gaze steadily at the cross with the other. The chalk is then held between the thumb and forefinger, and passed over the surface of the board with short shaking motions, and the patient, with his eye always fixed upon the cross, is requested to say when the chalk disappears from sight. The points of disappearance are marked on the board, and by this means a rough outline of the field of vision is drawn. This process is repeated two, three, or more times (in proportion to the uncertainty of the vision, or the stupidity of the patient), until a correct map of the field of vision is marked out. Considerable difficulty is often experienced at first in keeping the eye fixed upon the cross, and some patience has to be exercised. The practitioner should stand so as to be able to watch the patient's eye and keep it from wandering.

bladder, but especially the inner portion (with inverted image), was surrounded by a white and tolerably broad zone, which, from its sclerotic reflection, indicated clearly an atrophied portion of the choroid. It seemed similarly atrophied under the bladder, so that the latter lay between the retina and sclerotica, or, if one wishes it, between the retina and the atrophied choroidal tissue. The borders of the atrophied portion were irregular, here and there, as it were, indented, and showed pathological pigmentation. Similar choroidal changes, with pigment, were seen in other directions, especially in the outer part of the bottom of the eye. Whether Dr. Graefe has followed the further progress of the disease, I am unable to say. The left eye was quite sound, and the patient was neither troubled with tape-worms or superficial cysticerci, nor had he cranial symptoms.

VIII. *Cysticercus in the Vitreous Humor*.*—A journeyman joiner, ætat. 23, with convergent strabismus, came to Dr. Graefe to be operated upon. The patient said that the vision of the left eye, which squinted, had been weak from childhood. The left iris was only slightly less active than the right one, and of a yellowish-green color quite different from that of the right eye. This difference, together with the squinting, the patient's mother affirmed to be congenital. Single letters, $\frac{3}{4}$ in. in height, could be made out with this eye. The ophthalmoscope showed a round, central, circumscribed opacity, which looked like a posterior capsular cataract. A little behind this appeared a small bluish body, which,

attached to a darker bullet-shaped bladder, seemed, with the movements of the eye, to float to and fro in the vitreous humor. An examination with the inverted image, however, placed the form and position of these parts in a different light. The opacity appeared as a shining, white, oval figure, as is shown in Fig. 4 at *d*.

Fig. 4.



* This case was reported, with a colored drawing, by Dr. Liebreich, Dr. Graefe's chief assistant.

Behind and above it an oblong, bluish gray bladder extended through almost the whole vitreous humor. The anterior pear-shaped end at *c* seemed to represent the head, the succeeding portion the neck, and the sharply-defined oval piece, the bladder of a cysticercus. A fine membrane evidently surrounded the whole worm, and was continued backward in the form of a transparent sac (*a*) which could be traced to the bottom of the eye. Besides an irregular pigmentation on the retina, as shown in the figure (*f*), there was a marked discoloration in the papilla (*e*), and the retinal vessels were wanting in the outer and upper part.

The movements of the body were confirmed by the different parallaxes, thereby occasioned, of the several parts of the worm as they lay behind one another. After a prolonged examination, Dr. Graefe succeeded in detecting some slight movements in the oval end of the bladder (*b*), independent of the motions of the whole body. The extension and withdrawal of the head could not be seen here as in the previous cases, owing probably to the closely enveloping membrane which was evidently stiffly distended between the lens and retina. A peculiar wrinkling, occasioned by this, manifested itself by a series of fine shining rays, diverging anteriorly from the head of the worm, which were visible only by certain turns of the retina. (The rays are somewhat exaggerated in the engraving.) The peculiar appearance of the above-mentioned opacity (*d*) led to the suspicion that it might be a calcareous cysticercus which was placed flat against the posterior capsule. The closest examination with a strong microscope failed to show any further light upon the nature of it. No data could be obtained as to when the cysticercus was probably developed, nor could the former existence of inflammatory symptoms be elicited. More than a year's observation showed no particular change in the body. Several pieces of a tænia were passed after the exhibition of an anthelmintic. No cysticerci could be felt through the skin.

IX. *Cysticercus in the Vitreous Humor*.—H. M., a boy of 10 years, was brought to Dr. Graefe on account of weakness of vision in the right eye. The right iris was somewhat discolored, but gave more the appearance of a natural than a diseased discoloration. It was also slightly inactive and dilated. An ophthalmoscopic examination showed a cysticercus in the vitreous humor, so exactly like the one last mentioned that further description is hardly necessary. It is worthy of remark that the same ray-like wrinkles in the enveloping membrane were present in this case. Concerning the development of the entozoon, nothing was to be learned, since the patient had discovered his weakness of vision only a few weeks before, while experimenting with a lorgnette. The father of the child affirms that, twenty years before, he himself had passed tape-worms. The boy had had in his second year

otorrhœa, repeated impetigo capitis, many worms, and, as was said, tæniæ. An anthelmintic lately taken for tape-worms had been without result. The vision seemed to be limited more by the presence of a foreign body than by any amaurotic affection of the retina.

Remarks.—The above given cases of cysticerci in the posterior chamber of the eye, are the only ones that I have ever met with or heard of, and Dr. Graefe seems to have been more than ordinarily fortunate in discovering so many. It is a well-known fact that in Germany tape-worms are of very frequent occurrence. This is especially the case in Brunswick, where the famous Brunswick sausages are manufactured, which with many people constitute the chief article of animal food. Possibly, in those countries where tæniæ are common, no inconsiderable portion of amaurotic affections may have their origin in cysticerci.*

Cysticerci attached to the retina or behind it, prove to be much more frequent than those floating in the vitreous humor, the latter numbering only two, and the former seven. Cysticerci in the vitreous humor follow the rule of all foreign bodies, and become enveloped by a membrane. Their destructive progress seems to be remarkably slow, thus offering an important difference from those of the retina. Future experiments may perhaps bring them within reach of an operation.

With regard to the diagnosis, it is important to distinguish cysticerci from a separation and projection of the retina, which has also a rounded and bluish appearance. The existence of cysticerci may be suspected by the presence of fine floating membranes, which are to be distinguished from ordinary membranous opacities of the vitreous humor (the latter are generally of a fatty nature) by their much greater continuity. The sequelæ of cysticerci seem to be the same as those of retinal projection. When the disease has reached a certain development, there sets in a slow inflammation of the inner membranes, with separation of the retina and iris, which ends with closure of the pupil, projection of the iris against the cornea, and phthisis bulbi.

To conclude—the appearance of little round bluish spots at the bottom of the eye, like those in Cases I. and II. (Figs. 1 and 2), are regarded by Dr. Graefe as generally indicating choroidal affection, the color being occasioned by the sclerotica shining through. These spots often become united and form a larger circle. This *choroiditis disseminata* is frequently present in syphilitic and puerperal patients, and its course is much more rapid than that of the staphyloma posticum (which is an atrophy of the choroidal tissue immediately about the optic nerve). It may exist extensively without disturbing the functions of the retina.

* The identity of the cysticercus and tape-worm is well established.

